What is Claimed is:

1. A method of determining the time course of a biomolecular reaction comprising

(a) forming a first reagent mixture containing a reactant, a luminophore and a reaction partner wherein the reactant reacts with the reaction partner, and the luminophore participates with the reaction partner, or the reaction product of the reaction partner, to emit electrochemiluminescence upon exposure of the reagent mixture to electrical energy;

(b) exposing the first reagent mixture to a series of electrical pulses at a preselected potential and at preselected intervals of time and duration, and measuring the electrochemiluminescence at the same intervals to obtain a value for each interval;

(c) forming a second reagent mixture which is the same as the first reagent mixture;

(d) allowing the second reagent mixture to react until the reaction is complete and then exposing the mixture to a series of electrical pulses at the same potential, intervals of time and duration as in step (b) and measuring the electrochemiluminescence at the same intervals as in step (b) to obtain a value for each interval;

(e) forming a third reagent mixture which is the same as the first reagent mixture except that it does not contain the reaction partner;

41

(f)   exposing the third reagent mixture to a ser-
ies of electrical pulses at the same potential, inter-
vals of time and duration as in step (b) and measuring
the electrochemiluminescence at the same intervals as
in step (b) to obtain a value for each interval;

(g)   subtracting the value obtained for the first
interval in step (f) from the value obtained for the
first interval in step (b) to obtain a first differ-
ence;

(h)   subtracting the value obtained for the first
interval in step (f) from the value obtained for the
first interval in step (d) to obtain a second differ-
ence;

(i)   dividing the first difference by the second
difference to obtain a normalized value for the first
interval;

(j)   repeating steps (g), (h) and (i) for each
successive interval to obtain the normalized value for
each successive interval.

2.   The method of claim 1 wherein the reactant and the lu-
minophore are combined in a chemical moiety having the formula

$$[M(P)m(L^1)n(L^2)o(L^3)p(L^4)q(L^5)r(L^6)s]t(D)u$$

wherein M is ruthenium or osmium; P is a polydentate ligand of M;
L^1, L^2, L^3, L^4, L^5 and L^6 are ligands of M, each of which may be
the same as or different from each other ligand; D is a substance
covalently bound to one or more of P, L^1, L^2, L^3, L^4, L^5 or L^6

42

through one or more amide or amine linkages; m is an integer equal to or greater than 1; each of n, o, p, q, r and s is zero or an integer; t is an integer equal to or greater than 1; u is an integer equal to or greater than 1; and P, L^1, L^2, L^3, L^4, L^5, L^6 and D are of such composition and number that the chemical moiety can be induced to emit electromagnetic radiation and the total number of bonds to M provided by the ligands of M equals the coordination number of M.

3. The method of claim 1 wherein the luminophore is selected from the group consisting of fluorescent or phosphorescent polyaromatic hydrocarbons and fluorescent or phosphorescent transition metal chelates.

4. The method of claim 3 wherein the transition metal chelates are organometallic compounds.

5. The method of claim 1 wherein the luminophore is selected from the group consisting of Ru-containing and Os containing compounds.

6. The method of claim 1 wherein the luminophore is ruthe nium tris-bypyridine or osmium tris-bipyridine.

7. The method of claim 1 wherein the biomolecular reaction is an enzymatic reaction, the reagent mixture contains an enzyme and the reactant is a substrate on which the enzyme exerts catalytic action, and the reaction partner is a cofactor.

8. The method of claim 7 wherein the luminophore is selected from the group consisting of fluorescent or phosphorescent polyaromatic hydrocarbons and fluorescent or phosphorescent transition metal chelates.

43

9. The method of claim 7 wherein the enzyme is an oxido reductase.

10. The method of claim 9 wherein the oxido reductase is a dehydrogenase.

11. The method of claim 7 wherein the cofactor is a metal ion.

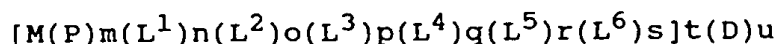12. The method of claim 7 wherein the cofactor is a coenzyme.

13. The method of claim 12 wherein the coenzyme is in its oxidized form.

14. The method of claim 1 wherein the biomolecular reaction is a binding reaction.

15. The method of claim 14 wherein the binding reaction i selected from the group consisting of antibody-antigen, ligand receptor, avidin-biotin, base pairing, lectin-carbohydrate, a enzyme-inhibitor.

16. The method of claim 14 wherein the luminophore is s lected from the group consisting of fluorescent or phosphoresce polyaromatic hydrocarbons and fluorescent or phosphorescent tra sition metal chelates.

17. The method of claim 14 wherein the reactant and th luminophore are combined in a chemical moiety having the formula

$$[M(P)m(L^1)n(L^2)o(L^3)p(L^4)q(L^5)r(L^6)s]t(D)u$$

wherein M is ruthenium or osmium; P is a polydentate ligand of M; L^1, L^2, L^3, L^4, L^5 and L^6 are ligands of M, each of which may be the same as or different from each other ligand; D is a substance

covalently bound to one or more of P, L^1, L^2, L^3, L^4, L^5 or L^6
through one or more amide or amine linkages; m is an integer
equal to or greater than 1; each of n, o, p, q, r and s is zero
or an integer; t is an integer equal to or greater than 1; u is
an integer equal to or greater than 1; and P, L^1, L^2, L^3, L^4, L^5,
L^6 and D are of such composition and number that the chemical
moiety can be induced to emit electromagnetic radiation and the
total number of bonds to M provided by the ligands of M equals
the coordination number of M.

18. A method of determining the time course of an enzymatic
reaction comprising

(a) forming a first reagent mixture containing an
enzyme, a reactant, a luminophore and a reaction part-
ner wherein the reactant reacts with the reaction part-
ner, and the luminophore participates with the reaction
partner, or the reaction product of the reaction part-
ner, to emit electrochemiluminescence upon exposure of
the reagent mixture to electrical energy;

(b) exposing the first reagent mixture to a ser-
ies of electrical pulses at a preselected potential and
at preselected intervals of time and duration, and
measuring the electrochemiluminescence at the same
intervals to obtain a value for each interval;

(c) forming a second reagent mixture which is the
same as the first reagent mixture;

(d) allowing the second reagent mixture to react
until the reaction is complete and then exposing the

45

mixture to a series of electrical pulses at the same potential, intervals of time and duration as in step (b) and measuring the electrochemiluminescence at the same intervals as in step (b) to obtain a value for each interval;

(e) forming a third reagent mixture which is the same as the first reagent mixture except that it does not contain the reaction partner;

(f) exposing the third reagent mixture to a series of electrical pulses at the same potential, intervals of time and duration as in step (b) and measuring the electrochemiluminescence at the same intervals as in step (b) to obtain a value for each interval;

(g) subtracting the value obtained for the first interval in step (f) from the value obtained for the first interval in step (b) to obtain a first difference;

(h) subtracting the value obtained for the first interval in step (f) from the value obtained for the first interval in step (d) to obtain a second difference;

(i) dividing the first difference by the second difference to obtain a normalized value for the first interval;

(j) repeating steps (g), (h) and (i) for each successive interval to obtain the normalized value for each successive interval.

19.   The method of claim 18 wherein the luminophore is se-
lected from the group consisting of fluorescent or phosphorescent
polyaromatic hydrocarbons and fluorescent or phosphorescent tran-
sition metal chelates.

20.   The method of claim 18 wherein the enzyme is an oxido
reductase.

21.   A method of determining the time course of a binding
reaction comprising

(a)   forming a first reagent mixture containing a
reactant, a reaction partner and a luminophore, wherein
the reactant reacts with the reaction partner in a
reaction selected from the group consisting of anti-
body-antigen, ligand-receptor, avidin-biotin, base
pairing, lectin-carbohydrate, and enzyme-inhibitor, and
the luminophore participates with the reaction partner
to emit electrochemiluminescence upon exposure of the
reagent mixture to electrical energy;

(b)   exposing the first reagent mixture to a ser-
ies of electrical pulses at a preselected potential and
at preselected intervals of time and duration, and
measuring the electrochemiluminescence at the same
intervals to obtain a value for each interval;

(c)   forming a second reagent mixture which is the
same as the first reagent mixture;

(d)   allowing the second reagent mixture to react
until the reaction is complete and then exposing the
mixture to a series of electrical pulses at the same

47

potential, intervals of time and duration as in step (b) and measuring the electrochemiluminescence at the same intervals as in step (b) to obtain a value for each interval;

(e) forming a third reagent mixture which is the same as the first reagent mixture except that it does not contain the reaction partner;

(f) exposing the third reagent mixture to a series of electrical pulses at the same potential, intervals of time and duration as in step (b) and measuring the electrochemiluminescence at the same intervals as in step (b) to obtain a value for each interval;
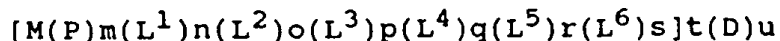
(g) subtracting the value obtained for the first interval in step (f) from the value obtained for the first interval in step (b) to obtain a first difference;

(h) subtracting the value obtained for the first interval in step (f) from the value obtained for the first interval in step (d) to obtain a second difference;

(i) dividing the first difference by the second difference to obtain a normalized value for the first interval;

(j) repeating steps (g), (h) and (i) for each successive interval to obtain the normalized value for each successive interval.

22. The method of claim 21 wherein the reactant is attached to the luminophore to form a chemical moiety having the formula

$$[M(P)m(L^1)n(L^2)o(L^3)p(L^4)q(L^5)r(L^6)s]t(D)u$$

wherein M is ruthenium or osmium; P is a polydentate ligand of M; L^1, L^2, L^3, L^4, L^5 and L^6 are ligands of M, each of which may be the same as or different from each other ligand; D is a substance covalently bound to one or more of P, L^1, L^2, L^3, L^4, L^5 or L^6 through one or more amide or amine linkages; m is an integer equal to or greater than 1; each of n, o, p, q, r and s is zero or an integer; t is an integer equal to or greater than 1; u is an integer equal to or greater than 1; and P, L^1, L^2, L^3, L^4, L^5, L^6 and D are of such composition and number that the chemical moiety can be induced to emit electromagnetic radiation and the total number of bonds to M provided by the ligands of M equals the coordination number of M.

23. The method of claim 21 wherein the luminophore is selected from the group consisting of fluorescent or phosphorescent polyaromatic hydrocarbons and fluorescent or phosphorescent transition metal chelates.
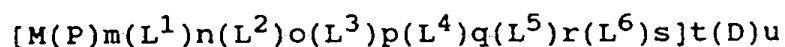
24. A system for determining the time course of a biomolecular reaction comprising

a first reagent mixture containing as reagents a reactant, a luminophore and a reaction partner wherein the reactant reacts with the reaction partner, and the luminophore participates with the reaction partner, or the reaction product of the reaction partner, to emit electrochemiluminescence upon exposure of the

49

reagent mixture to electrical energy; a s cond reagent mixture which is the same as the first reagent mixture except that it comprises reacted reagents; and a third reagent mixture which is the same as the first reagent mixture except that it does not contain the reaction partner;

a means for separately exposing each of the first, second and third reagent mixtures to a series of electrical pulses at a preselected potential and at preselected intervals of time and duration; and a means for measuring the electrochemiluminescence at the same intervals.

25. The system of claim 24 wherein the reactant and the luminophore comprise a chemical moiety having the formula

$$[M(P)m(L^1)n(L^2)o(L^3)p(L^4)q(L^5)r(L^6)s]t(D)u$$

wherein M is ruthenium or osmium; P is a polydentate ligand of M; L^1, L^2, L^3, L^4, L^5 and L^6 are ligands of M, each of which may be the same as or different from each other ligand; D is a substance covalently bound to one or more of P, L^1, L^2, L^3, L^4, L^5 or L^6 through one or more amide or amine linkages; m is an integer equal to or greater than 1; each of n, o, p, q, r and s is zero or an integer; t is an integer equal to or greater than 1; u is an integer equal to or greater than 1; and P, L^1, L^2, L^3, L^4, L^5, L^6 and D are of such composition and number that the chemical moiety can be induced to emit electromagnetic radiation and the total number of bonds to M provided by the ligands of M equals the coordination number of M.

26. The system of claim 24 wherein the luminophore is selected from the group consisting of fluorescent or phosphorescent polyaromatic hydrocarbons and fluorescent or phosphorescent transition metal chelates.

27. The system of claim 26 wherein the transition metal chelates are organometallic compounds.

28. The system of claim 24 wherein the luminophore is selected from the group consisting of Ru-containing and Os-containing compounds.

29. The system of claim 24 wherein the luminophore is ruthenium tris-bypyridine or osmium tris-bipyridine.

30. The system of claim 24 wherein the biomolecular reaction is an enzymatic reaction, the reagent mixture contains an enzyme and the reactant is a substrate on which the enzyme exerts catalytic action, and the reaction partner is a cofactor.

31. The system of claim 30 wherein the luminophore is selected from the group consisting of fluorescent or phosphorescent polyaromatic hydrocarbons and fluorescent or phosphorescent transition metal chelates.

32. The system of claim 31 wherein the enzyme is an oxide reductase.

33. The system of claim 32 wherein the oxido reductase is a dehydrogenase.

34. The system of claim 31 wherein the cofactor is a metal ion.

35. The system of claim 31 wherein the cofactor is a coenzyme.

51

36. The system of claim 35 wherein the coenzyme is in its oxidized form.